

REMARKS

The Office Action mailed June 29, 2005 has been carefully considered. The Applicants have amended Claims 1, 15, 18 and 28 and have added new Claims 35 and 36. Reconsideration in view of the above amendments and following remarks is respectfully requested.

Title of the Invention

The Title of the Invention has been changed in order to be more descriptive. The title has been amended to now recite "Method and Apparatus for Delivering High Current Power and Ground Voltages Using Top Side of Chip Package Substrate."

Drawings

The informal drawings originally filed with the present application have been objected to in the Office Action. The Office Action has, however, allowed formal drawings to be submitted at any time during prosecution of the application. The Applicants have not included formal drawings with this response, but will do so in due course.

Rejection(s) Under 35 U.S.C. § 112, Second Paragraph

Claim 16 stands rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. The Applicants respectfully traverse.

Claim 16 recites that the first surface of a package substrate is substantially orthogonal to the second surface. Claim 16 is dependent on Claim 15 which recites, among other things, that the package substrate includes a first surface having a ball grid array and a second surface array having at least one contact pad. It is stated in the present specification that the contact pads can

be on the edges or vertical sides of the package substrate. (Present Specification, Page 7, Lines 14-15). In an embodiment, the vertical sides of the package substrate are substantially orthogonal to the top or bottom side of the substrate. Accordingly, Claim 16 is definite in that the subject matter claimed therein was adequately disclosed in the present specification. For at least these reasons, Claim 16 overcomes the rejection and is allowable.

Rejection(s) Under 35 U.S.C. § 102

Claims 1, 2, 15, 17-21, and 28 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Pat. No. 6,282,100 to Degani et al. (hereinafter Degani). The Applicants respectfully traverse.

It will be appreciated that, according to the M.P.E.P., a claim is anticipated under 35 U.S.C. § 102 only if each and every claim element is found, either expressly or inherently, in a single prior art reference.

Claim 1 recites, among other things, an electrical connection between the PWB (printed wiring board) and the package substrate, the electrical connection for coupling the first contact pad of the printed wire board (PWB) with the first contact pad of the package substrate. This element is not taught in Degani. Degani instead discloses that the bottom side of the Intermediate Interconnect Substrate (IIS) element 15 is bonded to the top side of the PWB 21. There is no mention anywhere in Degani of an electrical connection between the substrate 15 and the PWB 21. In fact, Degani teaches away from electrical connection between the first contact pad of the PWB and the first contact pad of the package substrate (see below under the 103(a) Rejections section). For at least these reasons, Claim 1 is distinguishable over Degani and is in a condition for allowance.

Claim 2 has also been rejected in light of Degani. However, Claim 2 is dependent on Independent Claim 1. As stated above, Claim 1 is allowable over Degani. Accordingly, Claim 2 is allowable for being dependent on an allowable base claim.

Claim 15 recites, among other things, a package substrate comprising a first surface having a ball grid array of a plurality of solder balls adapted to come into contact with a PWB and a second surface having at least one contact pad adapted to be electrically connected to the PWB, wherein the at least one chip is mounted onto the second surface of the package substrate. As stated above, Degani does not disclose that the IIS element has a ball grid array adapted to come into contact with the PWB. In fact, Degani teaches away from the notion of using the ball grid array (see below under the 103(a) Rejections section). Accordingly, Degani does not teach each and every element in Claim 15. For at least these reasons, Claim 15 is distinguishable over Degani and is in a condition for allowance.

Claims 17 and 18 have also been rejected in light of Degani. However, Claims 17 and 18 are dependent on Independent Claim 15. As stated above, Claim 15 is allowable over Degani. Accordingly, Claims 17 and 18 are allowable for being dependent on an allowable base claim.

Claim 19 recites, among other things, a method for interconnecting a chip package to a PWB, a package substrate including a first surface having a BGA of a plurality of solder balls and connecting the first surface of the package substrate of the chip package to the PWB via the plurality of solder balls of the BGA. In fact, Degani teaches away from the notion of using the ball grid array (see below under the 103(a) Rejections section). As stated above, Degani does not disclose connecting the first surface of the IIS element to the PWB via a plurality of solder balls. Accordingly, Degani does not teach each and every element in Claim 19. For at least these reasons, Claim 19 is distinguishable over Degani and is in a condition for allowance.

Claim 20 recites, among other things, an apparatus for interconnecting a chip package to a PWB, a package substrate including a first surface having a BGA of a plurality of solder balls and means for connecting the first surface of the package substrate of the chip package to the PWB via the plurality of solder balls of the BGA. As stated above, Degani does not disclose that the IIS element has a means for connecting the first surface of the package substrate to the PWB. In fact, Degani teaches away from the notion of using the ball grid array (see below under the 103(a) Rejections section). Accordingly, Degani does not teach each and every element in Claim 20. For at least these reasons, Claim 20 is distinguishable over Degani and is in a condition for allowance.

Claim 21 has also been rejected in light of Degani. However, Claim 21 is dependent on Independent Claim 20. As stated above, Claim 20 is allowable over Degani. Accordingly, Claim 21 is allowable for being dependent on an allowable base claim.

Claim 28 recites, among other things, an apparatus for interconnecting a chip package to a PWB, the chip package comprising at least one chip and a package substrate including a first surface having a BGA of a plurality of solder balls adapted to be located between the chip package and the PWB and a second surface having at least one contact pad. As stated above, Degani does not teach that the IIS element has the BGA located between the substrate and the PWB. In fact, Degani teaches away from the notion of using the ball grid array (see below under the 103(a) Rejections section). Accordingly, Degani does not teach each and every element in Claim 28. For at least these reasons, Claim 28 is distinguishable over Degani and is in a condition for allowance.

Rejection(s) Under 35 U.S.C. § 103 (a)

Claims 3 and 10 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Degani. In particular, it is stated in the Office Action that one skilled in the art would incorporate solder bonding instead of die bonding in connecting the chip package with the PWB. The Applicants respectfully disagree.

According to the Manual of Patent Examining Procedure (M.P.E.P.),

To establish a *prima facie* case of obviousness, three basic criteria must be met. First there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in the applicant's disclosure.

Degani does not hint, teach or suggest that solder balls or direct interconnections be placed between the IIS element and the PWB. In fact, Degani teaches away from such a notion. Degani expressly states that the IIS element is die bonded to the PWB, whereby the die bond precludes solder ball or solder bump interconnections between the IIS and the PWB. (Degani, Col. 4, Lines 10-15). In addition, Degani expressly defines the term die bond to exclude the presence of direction interconnection across the interface between the IIS element and the PWB. (Degani, Col. 4, Lines 15-20). Therefore, one skilled in the art upon reading Degani, would have no motivation to place solder balls or direct interconnections between the IIS and the PWB. Accordingly, Claims 3 and 10 are patentable over Degani and are in a condition for allowance.

Claims 4-7, 11, 12, 22-25 and 29-32 were rejected under 35 U.S.C. § 103(a) as unpatentable over Degani in view of U.S. Pat. No. 6,336,260 to Eldridge (hereinafter Eldridge).

However, Claims 4-7, 11 and 12 are dependent on Independent Claim 1; Claims 22-25 are dependent on Independent Claim 21; Claims 29-32 are dependent on Independent Claim 28. As stated above, Claims 1, 21 and 28 are allowable over Degani. Accordingly, Claims 4-7, 11, 12, 22-25 and 29-32 are allowable for being dependent on allowable base claims.

Claims 8, 9, 13, 14, 26, 27 33, and 34 were rejected under 35 U.S.C. § 103(a) as unpatentable over Degani in view of U.S. Pat. No. 5,866,943 to Mertol (hereinafter Mertol). However, Claims 8, 9, 13 and 14 are dependent on Independent Claim 1; Claims 26 and 27 are dependent on Independent Claim 21; and Claims 33 and 34 are dependent on Independent Claim 28. As stated above, Claims 1, 21 and 28 are allowable over Degani. Accordingly, Claims 8, 9, 13, 14, 26, 27 33, and 34 are allowable for being dependent on allowable base claims.

New Claims

The Applicants have added new Claims 34 and 35. The Applicant submit that these claims are fully supported by the specification and do not contain new matter. In addition, new Claims 34 and 35 are patentable over the prior art. Accordingly, Claims 34 and 35 are in a condition for allowance.

Conclusion

In view of the preceding discussion, Applicants respectfully urge that the claims of the present application define patentable subject matter and should be passed to allowance.

If the Examiner believes that a telephone call would help advance prosecution of the present invention, the Examiner is kindly invited to call the undersigned attorney at the number below.

Please charge any additional required fees, including those necessary to obtain extensions of time to render timely the filing of the instant Amendment and/or Reply to Office Action, or credit any overpayment not otherwise credited, to our deposit account no. 50-1698.

Respectfully submitted,
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